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CONSTRUCTION MATERIAL AND ELEMENT PRODUCED THEREFROM

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A construction material contains at least two basic components and a curable binder for them. A first component consists of, at least partially, shell gravel and/or lime sand and/or fly ash and a second component consists of 18-28 vol% elastically shapable particles, calculated relative to the total volume after the curing of the binder. The construction material is suitable as a concrete replacement and as masonry mortar.

Claims

1. At least two basic components and a construction material containing a curable binder for them, characterized in that a first component consists of, at least partially, shell gravel and/or lime sand and/or fly ash and a second component, consisting of 18-28 vol% elastically shapable particles, calculated relative to the total volume after the curing of the binder.

2. Construction material according to Claim 1, characterized in that it contains 12-17 vol% cement, calculated relative to the total volume after the curing of the binder, as a curable binder.

3. Construction material according to one of Claims 1-2, characterized in that it also contains plant fibers and 35-45 vol% hard expanding particles, calculated relative to the total volume after the curing of the binder.

4. Construction material according to Claim 3, characterized in that it contains agave fibers as plant fibers, in a quantity which, together with the shell gravel quantity and/or the lime sand quantity and/or the fly ash quantity, is 18-28 vol%, calculated relative to the total volume after the curing of the binder.

5. Construction material according to any of Claims 3-4, characterized in that it contains, as the expanding particles, particles from at least one of glass and clay.

6. Construction material according to any of Claims 1-5, characterized in that the elastically shapable particles are formed by particles of at least one of rubber particles and cork particles.

7. Construction material according to one of Claims 1-6, characterized in that it also contains particles of plastic scrap as elastically shapable particles.

8. Construction material according to one of Claims 1-8, characterized in that the first component consists of shell gravel.

9. Construction material according to Claim 8, characterized in that it contains 35-45% expanded glass and/or clay particles, 18-28% rubber particles and/or cork particles and perhaps plastic scrap particles, 18-28% shell gravel and agave fibers, and 12-16% cement, wherein the percents are vol%, calculated relative to the total volume after curing of the cement.

10. Construction material according to Claim 9, characterized in that it contains 40% expanded glass and/or clay particles, 23% rubber particles and/or cork particles and perhaps plastic scrap particles, as a whole, 23% shell gravel and agave fibers, and 14% cement, wherein the percents are vol%, calculated relative to the total volume after the curing of the cement.

11. Construction material according to one of Claims 1-7, characterized in that the first basic component consists of lime sand and/or fly ash.

12. Construction material according to Claim 11, characterized in that the first basic component consists of almost the same volumes of lime sand and fly ash.

13. Construction material according to one of Claims 11-12, characterized in that it contains 35-45% expanded glass and/or clay particles, 18-28% rubber particles and/or cork particles and perhaps plastic scrap particles, 18-28% agave fibers and/or lime sand and/or fly ash and 12-16% cement, wherein the percents are vol%, calculated relative to the total volume after the curing of the cement.

14. Construction material according to Claim 12, characterized in that it contains 40% expanded glass and/or clay particles, 23% rubber particles and/or cork particles and perhaps plastic scrap particles, 23% of a quantity consisting of agave fibers and the same quantities of lime sand and fly ash, and 14% cement, wherein the percents are vol%, calculated relative to the total volume after the curing of the cement.

15. Construction material according to one of Claims 1-2, characterized in that in addition to the binder, it contains the shell gravel and/or the lime sand and/or the fly ash and the elastically shapable particles, 47-57 vol% fine sand, calculated relative to the total volume after the curing of the binder, whereas the elastically shapable particles are present in powder form.

16. Construction material according to Claim 15, characterized in that it contains 18-28% rubber powder, 47-57% fine sand, 5-15% shell gravel and 13-17% cement, wherein the percents are calculated relative to the total volume after the curing of the cement.

17. Construction material according to Claim 16, characterized in that it consists of 23% rubber powder, 52% fine sand, 10% shell gravel, and 15% cement, relative to the total volume after the curing of the cement.

18. Construction material according to Claim 15, characterized in that it contains 18-28% rubber powder, 47-57% fine sand, 5-15% lime sand and/or fly ash and 13-17% cement, wherein the percents are volume percents, calculated relative to the total volume after the curing of the cement.

19. Construction material according to Claim 18, characterized in that it consists of 23% rubber powder, 52% fine sand, 5% lime sand, 5% fly ash and 15% cement, calculated relative to the total volume after the curing of the cement.

20. Element produced from the construction material according to one of the preceding claims.

The invention under consideration concerns a construction material containing at least two basic components and a curable binder.

A known construction material of this type is concrete, which contains as basic components, sand and gravel, and as a curable binder, cement. This construction material has good mechanical characteristics, but insulates poorly. It has been possible to improve the insulating character of the concrete in that it is subjected to certain treatments for the formation of so-called pumice concrete, but which takes place at the expense of the mechanical characteristics.

Also, it was possible to increase the insulation capacity of elements produced from concrete in that they were combined with insulating layers to form new joined construction elements. Thus, from two concrete panels with intermediately enclosed sand filling, joined construction elements are known. Not only is the sound dampening of these joined elements still very low, but these elements are relatively heavy, wherein they can be easily damaged at the construction site or during transport. Cracks or heat leakages can arise due to the transport, vibrations, or temperature influences. Furthermore, these elements are relatively expensive.

The subject of the invention is to remedy these disadvantages and to create a relatively cheap construction material, which is very light, with permanent and good thermal insulation, and also sound-dampening and furthermore, has good mechanical characteristics after the curing of the binder.

For this purpose, there is a first basic component, consisting at least partially, of shell gravel and/or lime sand and/or fly ash, and there is a second basic component, consisting of elastically shapable particles, which are contained at 18-28 vol%, calculated relative to the total volume after the curing of the binder.

In an advantageous embodiment of the invention, the construction material contains 12-17 vol% cement, as the curable binder, calculated relative to the total volume after the curing of the binder.

In a special embodiment of the invention, the construction material also contains plant fibers and 35-45 vol% hard expanding particles, calculated relative to the total volume after the curing of the binder.

Especially in this embodiment, the construction material is suitable as a concrete replacement. The expanding particles increase the insulating characteristics, whereas the plant fibers improve the mechanical characteristics. Consequently, the construction material can also be used, according to this embodiment, for the casting of floors or for the production of vaults or masonry blocks.

Appropriately, the construction material contains agave fibers as plant fibers in a quantity which, together with that of the shell gravel, and/or the lime sand and/or the fly ash, is 18-28 vol%, calculated relative to the total volume according to the curing of the binder.

In a noteworthy embodiment of the invention, the elastically shapable particles are formed by at least one of the following types: rubber particles and cork particles.

Advantageously, the construction material also contains particles of plastic scrap as elastically shapable particles.

According to another special embodiment of the invention, the construction material contains, in addition to the binder, the shell gravel and/or the lime sand and/or the fly ash and the elastically shapable particles, 47-57 vol% fine sand, calculated relative to the total volume after the curing of the binder, whereas the elastically shapable particles are present in powder form.

In this embodiment, the construction material is suitable as masonry mortar, which, for example, is suitable so as to join with the construction material, masonry blocks, produced in accordance with one of the last-mentioned embodiments, with one another.

The invention also refers to an element produced from a construction material, in accordance with one the preceding embodiments.

Other details and advantages of the invention can be deduced from the following description of a construction material and an element produced therefrom in accordance with the invention.

The construction material in accordance with the invention is characterized by a special composition which contains two or more basic components, among others, elastically shapeable

particles and shell gravel and/or lime sand and/or fly ash and a curable binder for these basic components.

"Lime sand" refers to the grainy material from lime pits with a particle size between 0 and 2 mm. "Fly ash" refers to the ash released with the gas of a cement furnace.

The invention refers both to the binder in dry form before the curing of the binder or to pourable construction material in semiliquid form and also to the cured material, which forms either a construction element, in itself, or a binder for finished construction elements for the production of joined construction elements, such as walls and the like.

The percentages indicated below are vol%, calculated relative to the total volume of the construction material after the curing of the binder.

The construction material contains 12-17% cement as the binder.

The quantity of the elastic shapeable particles is between 18 and 28%.

These elastically shapeable particles provide for a good insulation, whereas shell gravel, lime sand, or fly ash also have a considerably better insulation capacity than the conventional sand.

Both the type of the elastically shapeable particles and also the additional components differ, depending on whether the construction material agrees with concrete or with a masonry mortar.

As a concrete replacement, the construction material contains rubber particles and/or coke particles, as elastically shapeable particles, to which, perhaps, particles of plastic scrap are admixed.

In addition to these elastically shapeable particles, shell gravel and/or lime sand and/or fly ash and cement, the construction material also contains, in accordance with this embodiment, 35-45% expanded glass and/or clay particles and a certain quantity of plant fibers, preferably agave fibers.

The added quantities of shell gravel and/or lime sand and/or fly ash and agave fibers are 18-28%. The agave fibers increase the bending strength of the construction material after the curing, without impairing the insulation characteristics. These insulation characteristics are improved by the addition of the expanded particles.

One specially suitable composition of the construction material is the following:

40% expanded glass and/or clay particles;

23% rubber and/or cork particles and optionally, plastic scrap particles;

23% shell gravel and agave fibers; and

14% cement.

In this connection, the shell gravel can be replaced, entirely or partially, by a cheaper raw material, such as, for example, lime sand and/or fly ash.

If the shell gravel is entirely replaced by lime sand and fly ash, the latter preferably are present in the same volume percents.

Another composition which is also very suitable, at least for certain applications, then consists also of:

40% expanded glass and/or clay particles;

23% rubber and/or cork particles, and optionally, plastic scrap particles;

23% lime sand, fly ash, and agave fibers (with the same quantities of lime sand and fly ash);

14% cement.

This construction material is suitable for all applications, wherein concrete is also used, such as for the local casting of floors or posts and the like at the construction site, or for the production of prefabricated construction elements, such as vaults, plates, and masonry blocks.

After the curing of the construction material, an end product with a small specific weight between 850 and 1200 kg/m^3 is obtained in all these applications. The end product has both good sound-dampening and also good heat-insulating characteristics. In spite of these good insulating characteristics, it also has good mechanical characteristics and, in particular, a good bending strength and pressure resistance.

In the embodiment as masonry mortar, as the mortar replacement, the construction material contains elastically shapeable particles which are present in powder form and thus considerably smaller than those of the embodiment described above.

Preferably, these elastically shapeable particles are rubber powder.

In this embodiment, the construction material does not contain agave fibers, but rather a quantity of shell gravel and/or lime sand and/or fly ash, which lies between 5 and 15%.

In addition to 5-15% shell gravel and/or lime sand and/or fly ash, 13-17% cement and 18-28% rubber powder, the construction material also contains 47-57% fine sand.

After the addition of water to the dry substance and before the curing of the cement, a masonry mortar, which can be used in the same way as the conventional mortar, is obtained. The insulating capacity, in particular, the sound insulating capacity of the masonry mortar, is significantly superior to that of known mortars.

A very suitable composition of a masonry mortar consists of:

15% cement;

23% rubber powder;

52% fine sand; and

10% shell gravel.

Another very suitable composition of a masonry mortar consists of:

15% cement;

23% rubber powder;

52% fine sand;

5% lime sand; and

5% fly ash.

The masonry mortar is very specially suitable for the joining of construction elements, such as masonry blocks, formed from the construction material in accordance with the first embodiment.

If blocks are formed from this construction material, in accordance with the embodiment described above in which it can replace the concrete, then these blocks are preferably provided in one or more side edges with a groove or in one or more other side edges with a projection corresponding to such a groove. The height of this projection, however, is smaller than the depth of the groove so that if a masonry block is inserted into a groove in a side edge of an adjacent masonry block, with a projection on a side edge, space remains which can be filled with the masonry mortar. The masonry blocks can be covered, on one or both sides, with a plaster, which is applied, in advance, and is very adhesive due to the type of the material from which they are produced. Instead of a plaster, a weather-resistant plastic layer can be placed on the sidewall also, so that the masonry blocks can be used for the building of outside walls. The masonry blocks produced with the material described above can have the form of plates and be used for the production of a roof. A roof covering based on bitumen adheres very strongly to these plates due to the type of construction material from which the roof plates are produced. For the same reason, a plaster adheres very strongly to the underside of the roof plates.

The masonry blocks or plates, produced from the construction material in accordance with the first embodiment described above for the replacement of concrete, can have relatively large dimensions because of their low specific weight. These elements can be either hollow or full. Aside from a possible covering of the outside of the elements, the latter can be made exclusively of the cured construction material. As a result, not only is the production of these elements rather simple, but all disadvantages of elements consisting of several layers of completely different materials, such as the danger of cracks, moisture bridges, and so forth, are avoided.

After the curing of the binder, the construction material is refractory and retains its good insulating and mechanical characteristics unchanged.

The invention under consideration is in no way limited to the embodiments described above, but rather also refers to all changes, additions, and adaptations of the same, among other things, with regard to the type and number of components and the used quantities, provided that the invention framework is not exceeded.